

CLAIMS:

1. A process for manufacturing a multilayer container having a transparent outer layer around the periphery of the container, wherein the outer layer comprises a clear thermoplastic polymer material is transparent in the solid state, and at least one other inner layer, the process comprising the steps: (1) heating each of at least two thermoplastic polymers to a temperature above the melt temperature of each to obtain a homogeneous melt of each of the at least two polymers; (2) co-extruding the at least two thermoplastic polymers through a co-extrusion blow molding head into an open mold; (3) using an extrusion blow molding machine to blow mold the at least two thermoplastic polymeric materials to form a blow molded structure having an internal (inside) surface and an external (outside) surface, wherein the blow molding machine comprises (i) a first head for extruding a first thermoplastic polymer that is to be used as the outer layer, and at least a second head for extruding at least one additional polymer wherein at least the first head has been modified to extrude a homogeneous melt of the first thermoplastic polymer; (ii) (a) a mold comprising a first cooling means for cooling the outside of the blow molded structure and (b) a second cooling means for cooling the inside of the blow molded structure as it is blow molded; (iii) a pinch off area and a dual pinching means for pinching the outer layer in a manner such that the outer layer forces the at least one other layer out of the pinch off area; and, (5) using the first and second cooling means to cool the inside and outside of the blow molded structure to a temperature below about 22°C, while forming the blow molded structure.
2. The process of Claim 1 wherein only a first and a second polymer are extruded in the process.
3. The process of Claim 2 wherein the second head has been modified to extrude a homogeneous melt of the second polymer.

4. The process of Claim 3 wherein the first cooling means is a mold maintained at a temperature of less than 20 °C, and the second cooling means is a means for discharging cold gas under pressure.
5. The process of Claim 4 wherein the cold gas is discharged at a temperature of less than about 20°C.
6. The process of Claim 5 wherein the cold gas is discharged at a temperature of less than about 18 °C.
7. The process of Claim 6 wherein the cold gas is discharged at a temperature of less than about 15 °C.
8. The process of Claim 7 wherein the cold gas is discharged at a temperature of less than about 5 °C.
9. The process of Claim 8 wherein the first polymer is a polymer selected from the group consisting of: polyurethanes; acrylic polymers; styrene acrylonitrile (SAN) copolymers; copolymers of ethylene and alpha, beta-unsaturated carboxylic acids and/or their derivatives; polyamides; and polyvinyl chlorides.
10. The process of Claim 9 wherein the first polymer is a copolymer of ethylene and an unsaturated carboxylic acid.
11. The process of Claim 10 wherein the first polymer is an ionomer.
12. The process of Claim 11 wherein the process additionally comprises the step of: using the pinching means to pinch off the blow molded structure and obtain a blow molded structure having a continuous transparent outer layer around the periphery of the article wherein the pinched point is flat or at tapered at least slightly toward the inner cavity of the blow molded structure, and wherein the mold surface is roughened, not polished.
13. An article made by the process of Claim 1, having a DOI which is identical or similar to the DOI of glass.
14. The article of Claim 13 wherein the article comprises a transparent outer layer of at least about 1.5 mm to about 5.0 mm.
15. The article of Claim 14 wherein the transparent outer layer is a polymer selected from the group consisting of: polyurethanes; acrylic

polymers; SAN; copolymers of ethylene and alpha, beta-unsaturated carboxylic acids and/or their derivatives; polyamides; and polyvinyl chlorides.

16. The article of Claim 15 wherein the transparent outer layer is an ionomer.

17. A process for manufacturing a multilayer container having a continuous transparent outer layer around the periphery of the container, wherein the outer layer comprises a clear thermoplastic material, and at least one other inner layer having a definite articulated border with the outer layer, the process comprising the steps: (1) heating each of at least two thermoplastic polymers to a temperature above the melt temperature of each to obtain the melt of each of the at least two polymers; (2) extruding the at least two thermoplastic polymers through a blow molding die into an open mold; (3) using an extrusion blow molding machine to blow mold the at least two thermoplastic polymeric materials to form a blow molded structure having an internal surface (inside) and an external surface (outside), wherein the blow molding machine comprises (i) a first die head for extruding a first thermoplastic polymer that is to be used as the outer layer, and at least a second die head for extruding at least one additional polymer wherein at least the first die head has been modified to extrude a homogeneous melt of the first thermoplastic polymer; (ii) a pinch off area and a dual pinching means for pinching the outer layer in a manner such that the outer layer forces the at least one other layer out of the pinch off area; (4) blow molding the extruded polymers (parison) to form a multilayer blow molded structure; (5) using the pinching means to pinch off the blow molded structure to obtain a blow molded structure having a continuous transparent outer layer, wherein the process does not include the step of cooling the inner surface of the parison.

18. The process of Claim 17 wherein only a first and a second polymer are extruded in the process.

19. The process of Claim 18 wherein the second die head has been modified to extrude a homogeneous melt of the second polymer.

20. The process of Claim 19 wherein the first polymer is a polymer selected from the group consisting of: polycarbonates; polyurethanes; acrylic polymers; SAN; copolymers of ethylene and alpha, beta-unsaturated carboxylic acids and/or their derivatives; polyamides; and polyvinyl chlorides.
21. The process of Claim 20 wherein the first polymer is a copolymer of ethylene and an unsaturated carboxylic acid.
22. The process of Claim 21 wherein the first polymer is an ionomer.
23. An article made by the process of Claim 17 wherein the thickness of the transparent outer layer is at least about 1.5 mm.
24. The article of Claim 23 wherein the transparent outer layer is a polymer selected from the group consisting of: polyesters; polycarbonates; polyurethanes; polyacetals; acrylic polymers; SAN; copolymers of ethylene and alpha, beta-unsaturated carboxylic acids and/or their derivatives; polyamides; and polyvinyl chlorides.
25. The article of Claim 24 wherein the transparent outer layer is an ionomer.
26. A process for manufacturing a transparent monolayer container comprising an acid copolymer ionomer, the process comprising: (1) heating the copolymer ionomer to a temperature above its melt temperature to obtain the melt of the copolymer; (2) extruding the copolymer through a co-extrusion blow molding head into an open mold; (3) using an extrusion blow molding machine to blow mold the copolymer to form a blow molded structure having an internal surface (inside) and an external surface (outside), wherein the blow molding machine comprises (i) a head for extruding a thermoplastic polymer wherein the die head has been modified to extrude a homogeneous melt of the thermoplastic polymer; and (ii) a means for cooling the inside of the blow molded structure as it is blow molded; (4) blow molding the extruded copolymer (parison) to form a blow molded structure; (5) using the cooling means to cool the inside of the blow molded structure to a temperature below the

melt temperature of the at least two thermoplastic polymers while forming the blow molded structure in the mold.

27. An article manufactured by an extrusion blow-molding process, wherein the article comprises multiple layers of polymer that have been
5 co-extruded into a mold, wherein the outermost layer of the article is an optically transparent layer of an ethylene/acid copolymer ionomer having a thickness of at least about 1.5 mm, and having a DOI which is identical or similar to the DOI of glass.

28. The article of Claim 27 wherein the optically transparent layer is
10 from about 1.5 mm thick to about 5.0 mm thick.

29. A process for manufacturing a multilayer container having a transparent outer layer around the periphery of the container, wherein the outer layer comprises a clear thermoplastic polymer material that is transparent in the solid state, and at least one other inner layer, the
15 process comprising the steps: (1) heating each of at least two thermoplastic polymers to a temperature above the melt temperature of each to obtain a homogeneous melt of each of the at least two polymers; (2) co-extruding the at least two thermoplastic polymers through a co-extrusion blow molding head into an open mold; (3) using an extrusion
20 blow molding machine to blow mold the at least two thermoplastic polymeric materials to form a blow molded structure having an internal (inside) surface and an external (outside) surface, wherein the blow molding machine comprises: (i) a first head for extruding a first thermoplastic polymer that is to be used as the outer layer, and at least a
25 second head for extruding at least one additional polymer wherein at least the first head has been modified to extrude a homogeneous melt of the first thermoplastic polymer; (ii) (a) a mold comprising a first cooling means for cooling the outside of the blow molded structure and (b) a second cooling means for cooling the inside of the blow molded structure as it is
30 blow molded; (iii) a pinch off area and a dual pinching means for pinching the outer layer in a manner such that the outer layer forces the at least one other layer out of the pinch off area; (4) blow molding the polymers

(parison) to form a multilayer blow molded structure; and, (5) using the first and second cooling means to cool the inside and outside of the blow molded structure to a temperature below about 22°C, while forming the blow molded structure, wherein the mold has a surface that is roughened and not polished.

5 30. An extrusion blow-molding machine for producing an article having a clear transparent thermoplastic polymer outer layer, comprising: at least one extrusion head which has been modified to extrude a homogeneous melt (parison) of the outer layer; a modified blow pin comprising as
10 modifications (a) a cooling jacket over at least 95% of the blow-pin surface, not inclusive of the blow pin gas outlet nozzle, and (b) a means to allow for gas to escape from inside the parison.